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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,372	08/02/2006	Yoichi Matsubara	Y-228 (NUBIC10494)	3142
802	7590	10/27/2009	EXAMINER	
PATENTTM.US			PETTITT, JOHN F	
P. O. BOX 82788			ART UNIT	
PORTLAND, OR 97282-0788			PAPER NUMBER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/551,372	Applicant(s) MATSUBARA ET AL.	
	Examiner John F. Pettitt	Art Unit 3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3 is/are pending in the application.
- 4a) Of the above claim(s) 1, 2 and 4-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/02/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of species D - Fig. 4 in the reply filed on 07/29/2009 is acknowledged. The traversal is on the ground(s) that the applicant submits that the searches and examination would be similar. This is not found persuasive because the different species disclosed are mutually exclusive. Further the lack of unity has been established and has proven by the prior art that the inventions do not share a common technical feature. Lastly the search for the different inventions would require divergent search queries and therefore, the requirement is still deemed proper and is therefore made FINAL.

2. **Claims 1-2 and 4-6** are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected inventions, there being no allowable generic or linking claim.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Pulse tube refrigerator with Heat Driven Pressure Generator.

Claim Objections

4. **Claim 3** is objected to because of the following informalities: The recitation "A pulse-tube refrigerator comprising a pulse tube, a cool storage unit connected to the low-temperature side of said pulse tube, a vibration generator connected to the high-

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temperature side of said cool storage unit, and a reservoir with an orifice connected to the high-temperature side of said pulse tube, wherein said vibration generator is a heat-driven pressure-wave generator comprising a heat-driven tube and a resonator connected to the inlet port of said heat-driven tube, wherein said heat-driven tube consists of a heat-storage unit, a heating heat exchanger, a radiation heat exchanger, and a work-transmission tube.” lacks antecedent basis and should read --A pulse-tube refrigerator comprising a pulse tube, a cool storage unit connected to a low-temperature side of said pulse tube, a vibration generator connected to a high-temperature side of said cool storage unit, and a reservoir with an orifice connected to the high-temperature side of said pulse tube, wherein said vibration generator is a heat-driven pressure-wave generator comprising a heat-driven tube and a resonator connected to a inlet port of said heat-driven tube, wherein said heat-driven tube consists of a heat-storage unit, a heating heat exchanger, a radiation heat exchanger, and a work-transmission tube.--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claim 3** is rejected under 35 U.S.C. 102(b) as being anticipated by Swift (US 4,953,366) hereafter Swift (366). Swift (366) teaches A pulse-tube refrigerator (Figures) comprising a pulse tube (32), a cool storage unit (24) connected to a low-temperature

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side (near 28) of said pulse tube (32), a vibration generator (10) connected to a high-temperature side (near 26, 34) of said cool storage unit (24), and a reservoir (38) with an orifice (36) connected to the high-temperature side (near 26, 34) of said pulse tube (32), wherein said vibration generator (10) is a heat-driven pressure-wave generator (column 2, line 63; 30-40) comprising a heat-driven tube (22, 16, 14, 18) and a resonator (19; column 4, line 24; column 5, lines 20-24) connected to an inlet port of said heat-driven tube (22, 16, 14, 18), wherein said heat-driven tube (22, 16, 14, 18) consists of a heat-storage unit (14), a heating heat exchanger (16), a radiation heat exchanger (18), and a work-transmission tube (22).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ceperley (US 4,114,380) hereafter Ceperly (380) in view of Swift (US 6,021,643) hereafter Swift

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(643). Ceperly (380) teaches a heat-driven pressure-wave generator (Fig. 1, 1-8) that comprises a resonator (acoustical wave source) and heat-driven tube consists a heat-storage unit (2), a heating heat exchanger (6), a radiation heat exchanger (5), and a work-transmission tube (1, 7, 8). Ceperly (380) explicitly teaches that the generator (1-8) is for a heat pump (such as a Stirling cooler; column 2, lines 60-65).

Ceperly (380) does not explicitly teach that the refrigerator is a pulse tube refrigerator comprising a pulse tube, a cool storage unit connected to a low-temperature side of said pulse tube, a vibration generator connected to a high-temperature side of said cool storage unit, and a reservoir with an orifice connected to the high-temperature side of said pulse tube. However, pulse tube refrigerators are well known in the art for providing cryogenic refrigeration with high reliability. Swift (643) teaches a pulse tube (24), a cool storage unit (22) connected to a low-temperature side of said pulse tube (24), a vibration generator (14) connected to a high-temperature side of said cool storage unit (22), and a reservoir (28) with an orifice (12) connected to the high-temperature side of said pulse tube (24). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the heat-driven pressure generator of Ceperly (380) to provide pressure waves to drive the pulse tube of Swift (643) for the purpose of providing a highly reliably cryogenic heat pump with no moving parts (Ceperly (380) - column 1, line 55; column 4, lines 30-34).

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swift (643) in view of Ceperly (380).

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Swift (643) teaches a pulse tube (24), a cool storage unit (22) connected to a low-temperature side of said pulse tube (24), a vibration generator (14) connected to a high-temperature side of said cool storage unit (22), and a reservoir (28) with an orifice (12) connected to the high-temperature side of said pulse tube (24).

Swift (643) does not explicitly teach that the vibration generator should be a heat driven pressure-wave generator. However, Ceperly (380) teaches a pressure wave generator (Fig.1) comprising a resonator (acoustical wave source) and heat-driven tube consists a heat-storage unit (2), a heating heat exchanger (6), a radiation heat exchanger (5), and a work-transmission tube (1, 7, 8); and that the generator has no moving parts and is disclosed as providing pressure wave generation for heat pump refrigerators (column 6, line 67). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the pulse tube of Swift (643) with the heat driven pressure generator of Ceperly (380) for the purpose of providing a cryocooler with no direct moving parts (Ceperly 380-column 1, line 26).

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John F. Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John F Pettitt /
Examiner, Art Unit 3744

/Cheryl J. Tyler/
Supervisory Patent Examiner, Art
Unit 3744

JFP III
October 15, 2009